<u>Maxima and Minima (Completing the Square)</u> **Date:________________**

When a quadratic relation is in **vertex form** $y = a(x-h)^2 + k$, we can sketch and analyze it easily. From this you should know its vertex, axis of symmetry, max or min value, and its appearance.

HOWEVER when a quadratic relation is written in **Standard Form** $y = ax^2 + bx + c$, we do not know as much about it so by **<u>"Completing the Square"</u>**, we can put it into the form $y = a(x-h)^2 + k$, to better sketch and analyze it.

EX: Write $y = x^2 + 8x + 3$ in the form $y = a(x-h)^2 + k$ by "**completing the square**". Graph it and analyze the parabola.

Steps:

1. Group the first two terms.
2. Take half of the b and square it. Add this number to the group (now a perfect square trinomial) and subtract it at the end.
3. Factor the perfect square trinomial and simplify the end.

EX: **"Completing the Square" when the coefficient of x^2 is not 1.**
Write $y = -2x^2 + 4x + 5$ in "vertex form".

Steps:

1. **Common factor the "a" out of the first two terms only.**
2. **Take half of the new x term coefficient and square it. Add and subtract this number inside the bracket.**
3. **Remove the last number from the bracket by distributive property.**
4. **Factor the perfect square trinomial and simplify the ending.**

<u>Application Problems</u>

A. Maximizing Revenue

EX: A theater company has 300 season ticket holders. The board decides they want to increase the price of season tickets from the current price of $400. A survey shows for every $20 price increase, they will lose 10 subscribers. What "new price" will maximize their revenue?
***Help them make more $ without losing too many customers.**

To make the relation use **REVENUE = # of subscribers X season ticket cost**

B. Maximizing Area

EX: **What is the maximum area that can be enclosed by 400m of fencing. Find the dimensions of the enclosed rectangle.**